



The Ice Age *Wisconsin's Glacial Legacy*



Detail from a mural commissioned for the
Wisconsin Department of Natural Resources.

A mere 15,000 years ago, during the Ice Age, most of northern North America lay under the grip of colossal ice sheets. The effects of the advancing and retreating glaciers can be seen in the headlands of Cape Cod, the Finger Lakes of New York, and the hills of Michigan, but nowhere is the glacier's mark upon the land more impressive than in Wisconsin. Indeed, the State has lent its name to the most recent series of glacial advances and retreats, the Wisconsin Glaciation lasting from about 100,000 to 10,000 years ago.



This illustration shows the extent of the ice sheet in Wisconsin during the last glaciation.



This large boulder, or erratic, was carried a great distance and deposited by the glacier.



This conical hill, or kame, was created through the action of water moving downward through cracks in the glacier. (Bill Moorman, photographer)



In Sheboygan County, the Ice Age Trail meanders across the top of an esker, formed by a stream under the glacier.

Many times during the last 2 million years, a time also known as the Pleistocene Epoch, the climate fluctuated between warmer and cooler temperatures. During the colder fluctuations, glaciers formed and spread outward from Arctic areas, engulfing most of northern North America. Each of the major glaciations has been followed by a warmer interglacial period, probably similar to that of today, during which the glaciers melted away.

The glacier most recently flowed into Wisconsin about 25,000 years ago and reached its greatest extent, covering approximately two-thirds of the State, about 14,000 to 16,000 years ago before melting back. The retreat of the ice front was interrupted a number of times by readvances; the last one touched northwestern Wisconsin about 10,000 years ago.

The advancing ice was channeled into the lowlands now occupied by Lakes Superior and Michigan, Green Bay, and the Fox River, and it was impeded by the uplands of the Bayfield, Keweenaw, and Door Peninsulas. The ice was thus split into six major lobes as it flowed across the State. The Green Bay Lobe, which had few obstructions in its path, penetrated as far south as present-day Janesville in Rock County.

The ice within the lobes was almost always sliding or creeping toward the edges of the glacier, even as it melted. As the ice moved, it froze around grains of sand, pebbles, and boulders, picked them up, and carried them along. Boulders that were carried great distances are called erratics. The material frozen into the base of the flowing ice gouged and scraped the land, leaving in some areas scratches, called striations, in the bedrock. In other areas streamlined, elongate hills called drumlins were formed. Wisconsin's State capitol sits atop one of these hills. Impressive clusters of them are found in the Campbellsport Drumlins Unit of the Ice Age National Scientific Reserve and in other areas, particularly southeastern Wisconsin. The striations and the long axis of the drumlins indicate the direction the ice flowed.

When the ice melted at the edges of the lobes, the sand, silt, cobbles, and boulders frozen in it were released and formed ridges called moraines. Even as the glacier melted back, ice usually continued to flow toward its edge, bringing more debris with it. Occasionally the flow stopped, the ice stagnated, and blocks of ice detached from the glacier were buried in debris. Many of Wisconsin's lakes lie in the depressions formed by the melting of the buried ice. These are called kettles.

The moraines vary greatly across the state. Those in the southwest are usually dry, narrow ridges sitting atop the older hills at the edge of the unglaciated Driftless Area. Across the northern counties the moraines form a broad band of hills and hollows—a poorly drained rocky landscape dotted with lakes, marshes, and bogs. The Chippewa Moraine Ice Age Reserve Unit is a particularly picturesque portion of these moraines, containing numerous depressions filled with lakes, bogs, and marshes. The moraine in Waushara County in the center of the State is similarly pitted with thousands of these depressions, but most of them are dry. The rugged, scenic Kettle Moraine in the eastern part of the State is actually a series of moraines formed between the Lake Michigan and Green Bay Lobes. The Green Bay Lobe also left a moraine in Sauk County which blocked both ends of a gorge in the Baraboo Hills creating Devil's Lake. Some moraines stand no more than 30 feet above the surrounding terrain, but others in the Kettle Moraine rise to heights of 250 to 300 feet.

Streams flowing over, under, and beyond the glacier also left deposits that vary our landscape. The conical hills of water-rounded sand and cobbles called kames, that stud parts of the Kettle Moraine, are deposits of streams that flowed downward through cracks in the ice. The sinuous eskers, such as the one near the Mondeaux Flowage in Taylor County and the Parnell Esker in Sheboygan County, are ridges of rounded sand and gravel deposited by streams that flowed through tunnels at the base of the glacier. Like drumlins, they are usually aligned parallel to the ice flow.



Kettle Lakes are formed as sand and gravel settled over a melting ice block.



The sandstone buttes of Mill Bluff in Monroe County were former islands in Glacial Lake Wisconsin.



Here the Ice Age Trail follows the Sugar River Trail in Green County, through a landscape untouched by the last glacier.



Glacial meltwater created spectacular formations such as the Dells of the Eau Claire in Marathon County.

The flowing meltwater spread fine layers of sand in broad plains, such as those in Langlade, Rock, and Portage Counties, that today are fertile cash crop farming areas. In several areas the meltwater pooled, forming large lakes where silt and clay collected. The flat bed of glacial Lake Wisconsin, one these lakes, is a marked contrast to the unglaciated hills of the Driftless Area that bound its western side. In the Fox River Valley, Lake Winnebago and Horicon Marsh are small remnants of another proglacial lake—Lake Oshkosh.

The torrents of meltwater released from the wasting glacier or draining from glacial lakes cut spectacular gorges in several areas of the State. Some, such as the Dalles of the St. Croix, the Wisconsin, Dells, and the Dells of the Eau Claire, are still occupied by streams. Others, like the smaller gorge at the Cross Plains Ice Age Reserve Unit, are now dry except for spring and storm run-off.

Although many of these features are outstanding by themselves, seen as a whole they form a glacial landscape of remarkable beauty. The thousands of drumlins, kames, and kettles and the numerous moraines, eskers, and features left by the fluctuating lobes of the last Wisconsin glacier appear very similar to features being formed by glaciers active today. The region of recent glaciation is dotted with over 14,000 glacial lakes; numerous bogs, marshes, and fens; and many streams whose courses are determined by the young glacial deposits. In a sense, this region of the State is still recovering from the melting of the last glacier. As the streams slowly wash away kames, eskers, and moraines, and as marshes, bogs, and lakes fill with sediment and organic debris, this young landscape will become like the older glacial landscape which lies between the Driftless Area and the terminal moraines of the most recent glaciation.

In the areas of Wisconsin that were glaciated prior to the most recent glaciation, erosion has had time to modify the landscape and, as a result, glacial landforms are subdued or unrecognizable. Lakes and bogs are much less common in this older landscape. Most have either been drained by gradually lengthening streams, or filled with sediment that has accumulated over thousands of years. The result is a gently rolling landscape or nearly flat plains broken by occasional remnant hills or ridges. The remnants of glacial debris tell us these areas were glaciated long ago, but relatively little is known about their glacial history.

In striking contrast to both of these glacial landscapes stands the dry upland of southwestern Wisconsin known as the Driftless Area. Much of this region is a rolling upland plain, with no glacial sediment, that has been deeply cut by streams into a maze of narrow, twisting ridges and valleys. There are few natural lakes, bogs, or marshes in this part of the State. Several prominent mounds, such as Blue Mound in eastern Iowa County, stand as erosion remnants well above the surrounding plain. This Driftless Area landscape has been forming for many thousands of years, whereas our most recent glacial landscape is but 15,000 years old or younger.

Wisconsin's legacy from the glaciers and meltwater streams of the Ice Age is a landscape of great diversity and beauty. The State's many lakes and ponds, forested hills and ridges, and gently rolling farmlands remind us of the glacier's visit and beckon us to come, explore, and enjoy!

